# PATENT SPECIFICATION 1,077,813

DRAWINGS ATTACHED.

1,077,813

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**Int. Cl.:**—**H 01 h 35/34** //B 01 d.


COMPLETE SPECIFICATION.

## Electric Switch.

We, UNITED-CARR INCORPORATED, a Corporation organised according to the laws of the State of Delaware, United States of America of 1014. Statler Office Building, Boston, 16, Massachusetts, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to an electric switch.

The present invention provides an electric switch comprising a casing of insulating material formed with a well-like recess defined by a peripheral wall formed with an annular shoulder, a flexible diaphragm seated on the shoulder so as to seal the open end of the recess and adapted to be secured in seating engagement with the shoulder by a cover plated secured to the casing and extending over the diaphragm, the cover plate having a vent therein, a flexible leaf spring contact mounted in the recess on the side of the diaphragm remote from the cover plate, the leaf spring contact extending transversely of the recess in spaced relation to the diaphragm and to a fixed contact also mounted in the recess, the bottom wall of the recess being formed with an aperture and a nozzle being provided leading from the aperture to the outside of the switch casing, the arrangement being such that on a predetermined drop in pressure in the space surrounding the nozzle, air will be exhausted from the recess through the aperture and nozzle so as to cause the diaphragm to flex inwardly to abut and displace the leaf spring contact to move it into engagement with the fixed contact.

To enable the invention to be fully understood, it will now be described, by way of example, with reference to the accompanying drawings in which:—

[*F* *d.*]

Figure 1 is a schematic representation, partly in section, showing a vacuum cleaner chamber provided with a switch according to one embodiment of the invention;

Figure 2 is a plan view of the switch with the diaphragm and cover plate removed;

Figure 3 is an under plan view of the switch shown in Figure 2 with the insulating cover removed;

Figure 4 is an under plan view of the switch with the cover in place;

Figure 5 is a section on an enlarged scale taken on lines 5—5 of Figure 4 with the diaphragm and movable contact in neutral position; and

Figure 6 is a section similar to Figure 5, partially in elevation, showing the diaphragm and movable contact actuated.

In the accompanying drawings, there is shown a switch 10 which is connected by a lead 12 to a socket 14 and connected by a lead 15 to an indicator light 16. The socket 14 in turn is connected by a second lead 13 to the indicator light 16, and it is also connected to a plug (no number) having leads which ultimately go to a source of electrical power. The socket 14 is formed of insulating material and, in this particular case, utilises a snap in groove type engagement with the vacuum chamber housing 18. The vacuum chamber housing 18 has an intake opening 20, which is attached by means well known in the art to a porous bag 22. There is also formed through the housing 18 directly across from and in line with the intake opening 20 an exhaust opening 24. Directly in front of and in close proximity to the exhaust opening 24, a fan 26 is mounted and driven by a motor 28. The fan 26 is preferably mounted within an inner housing 30, which has an opening in it on the same line as the intake and exhaust openings. In other words, the inner housing 30

places the fan 26 within a separate compartment from the remaining portion of the area defined by the vacuum chamber housing 18.

The switch 10 comprises a casing 32 formed of an insulating material including a bottom wall on a base 34, an inner upstanding circumferential wall 35, an outer circumferential wall 36 connected to the upper surface of said inner wall 35 by a connector portion 37. The connector portion 37 is on a plane in substantially spaced parallel relationship to the plane of the base 34. The outer wall 36 is in spaced circumscribing relationship with the base 34 and the inner wall 35 as shown in Figure 5. It also has a free edge extending beyond the plane of the base 34. An annular shoulder 38 is formed in the inner peripheral wall 35 spaced from the base 34.

The base 34 and the inner wall 35 define a compartment in the form of a well-like recess 40. A movable contact 42 formed of a strip of electrically conductive resilient metal has one end riveted to the base 34 and has bends formed in it whereby the major portion of the strip is spaced from the base 34 in substantial parallel relationship therewith. The base 34 has an aperture 44 formed therethrough which is continued as a chamber 47 and then as a channel or bore 46 of a hollow projection 48. The projection 48 extends from and is integral with the opposite side of the base 34 from the attachment of the contact 42. An internally threaded bushing 54 is attached through a hole in the base 34 and a fixed contact 50 comprising a screw threaded shank is threaded into the internally threaded bushing 54 so that its inner end is located in the well in spaced relation and directly below the free end of the contact 42 as indicated in Figure 5.

When, as shown, the contact 42 is riveted to the base 34, the same rivet is utilised to hold a ring terminal 52 on the opposite side of the base 34. The internally threaded bushing 54 includes a head portion and a tubular shank. A second ring terminal 56 is placed around the shank of the bushing 54 adjacent its head portion and then the bushing 54 is passed through a hole in the base 34 and curled over to complete the engagement therewith. Thus, in the disclosed construction there is a ring terminal on each side of the chamber 47 as shown in Figure 5. The slotted head of the shank of the contact 50 is accessible from outside the compartment or well 40 to enable the shank to be screwed inwardly or outwardly to adjust the position of the contact relative to the free end of the movable contact 42.

A diaphragm 58 of highly flexible material, in this case rubber, and having a circular configuration covers the open upper end of the well 40 with the peripheral edge of the diaphragm 58, which is formed of a thicker material than its centre portion, resting on the internal circumferential shoulder 38. The outer face of the diaphragm 58 is open to atmosphere but it seals the interior of the well 40 from direct contact with the atmosphere for a purpose to be set forth hereinafter. The top plane of the peripheral edge of the diaphragm 58 lies on the same plane as the top surface of the casing 32 of the switch 10. The more flexible centre portion of the diaphragm 58 is spaced below the upper surface of the peripheral edge and the upper surface of the casing 32 as shown in Figure 5. A pair of wing-like extensions 60 are formed by the outer wall 36 and the connector portion 37 on each side of the casing 32. Each of the wings 60 has an aperture formed through its portion of the connector portion 37. A cover plate 62 formed of cold rolled steel is placed over the casing 32 in superposed abutting relation to the edge of the diaphragm 58 and the extensions 60. An aperture is formed through each of the wings, which extends from the cover plate 62 and the configuration of the cover plate 62 is the same as the external configuration of the top surface of the casing 32. An air vent 64 is formed centrally in the cover plate 62 as indicated in Figure 5. On the opposite side of the base 34 from the contact 42 an insulating cover 66 is provided having a configuration which is the same as the bottom surface of the casing 32. The projection 48 has two portions, the first which is adjacent to the base 34, referred to hereinbefore as the chamber 47, has greater internal and external diameters than the remaining portion of the projection 48. An aperture is provided in each of the wings of the insulating cover 66 and a large aperture is formed axially in the insulating cover 66 so that the outer surface of the wall of the chamber 47 of the projection 48 can be passed therethrough. A small aperture 70 is formed in close proximity to the centrally located hole of the insulating cover 66 and is placed so as to be directly aligned with the head of the contact 50.

When the insulating cover 66 and the cover plate 62 are both in place on the casing 32, a through hole is provided in each wing of the assembly. An eyelet can now be passed through the apertures and the terminal ends of the eyelet curled over to hold the switch parts in assembly.

The exemplification in Figure 1 will be utilised to illustrate one way in which the switch 10 may be utilised. When a clean porous bag 22 has been placed over the intake opening 20 of the vacuum chamber housing 18 and the fan 26 is caused to rotate, air will be drawn both from the vacuum chamber and through the porous bag 22,

which tends to create a vacuum in the vacuum chamber housing and within the bag 22. As the bag 22 fills with dust etc. less air will be drawn from the outside through the bag 22 and more air will be drawn from within the vacuum chamber housing 18 thus reducing the pressure. This reduction in air pressure will also apply to the chamber 47 and the well 40 as the hollow projection 48 provides a communication between the chamber 18 and the well. Since the air pressure above the diaphragm 58 is maintained at the same level as that of the outside air through the utilisation of the air vent 64, when a predetermined reduced pressure is created on the inner face of the diaphragm, the latter will flex inwardly and actuate the movable contact 42 to engage the fixed contact 50 to close the switch. The contact 50 may be adjusted through the adjustment 70 with a screwdriver to a predetermined pressure condition within the vacuum chamber housing 18. When the required pressure condition is reached, the movable contact 42 will engage against the fixed contact 50 causing the circuit to be completed and the indicator light 16 to glow informing the housewife that the bag 22 has been filled.

WHAT WE CLAIM IS:—

1. An electric switch comprising a casing of insulating material formed with a well-like recess defined by a peripheral wall formed with an annular shoulder, a flexible diaphragm seated on the shoulder so as to seal the open end of the recess and adapted to be secured in seating engagement with the shoulder by a cover plate secured to the casing and extending over the diaphragm, the cover plate having a vent therein, a flexible leaf spring contact mounted in the recess on the side of the diaphragm remote from the cover plate, the leaf spring contact extending transversely of the recess in spaced relation to the diaphragm and to a fixed contact also mounted in the recess, the bottom wall of the recess being formed with an aperture and a nozzle being provided leading from the aperture to the outside of the switch casing, the arrangement being such that on a predetermined drop in pressure in the space surrounding the nozzle, air will be exhausted from the recess through the aperture and nozzle so as to cause the diaphragm to flex inwardly to abut and displace the leaf spring contact to move it into engagement with the fixed contact.

2. An electric switch according to Claim 1, wherein the fixed contact is adjustable relative to the leaf spring contact.

3. An electric switch according to Claim 2, wherein the fixed contact comprises a screw threaded shank extending through the bottom wall of the well-like recess and having its inner end positioned in the recess and its outer end accessible from outside thereof to enable the shank to be screwed inwardly or outwardly to adjust the position of the inner end relative to the leaf spring contact.

4. A vacuum cleaner comprising a chamber having an air porous dust bag supported therein and means being provided for creating a suction in the chamber so as to draw dust laden air through the bag whereby the dust is deposited in the bag, an electric switch according to any one of the preceding claims being mounted on the vacuum cleaner so that the said nozzle extends into the chamber and the vented cover plate is exposed to the outer atmosphere, an electrically operated signalling device being provided and connected in circuit with the leaf spring and fixed contacts and the arrangement being such that on a predetermined drop in the pressure in the said chamber due to the dust bag being filled with dust, a reduction in pressure will be created in the well-like recess of the switch to effect the flexing of the diaphragm to cause the leaf spring contact to engage the fixed contact to complete the circuit to energise the signalling device.

5. A vacuum cleaner according to Claim 4, wherein the signalling device comprises an electric lamp.

6. An electric switch substantially as described with reference to the accompanying drawings.

7. A vacuum cleaner having a signalling device controlled by a pressure responsive electric switch substantially as described with reference to Figure 1 of the accompanying drawings.

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1077813 COMPLETE SPECIFICATION

1 SHEET *This drawing is a reproduction of the Original on a reduced scale*

*Fig. 1.*

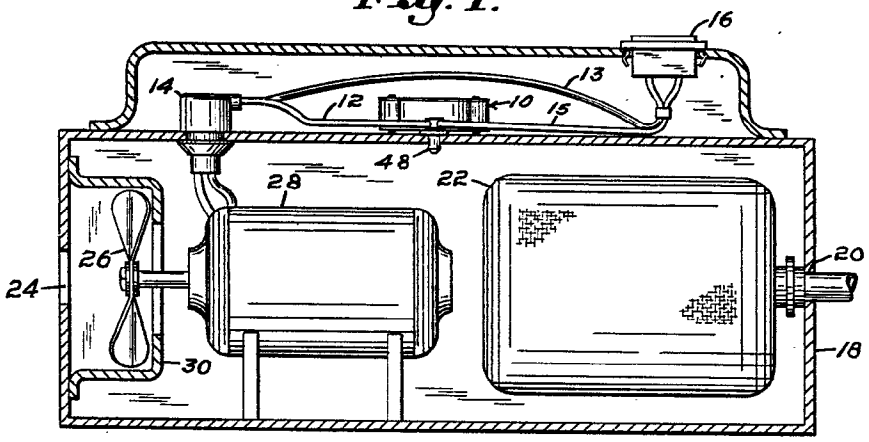



*Fig. 2.*

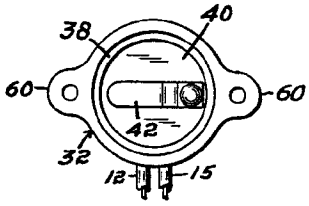
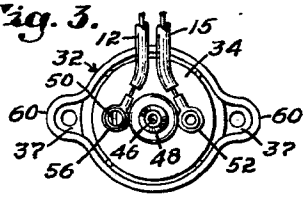



*Fig. 3.*



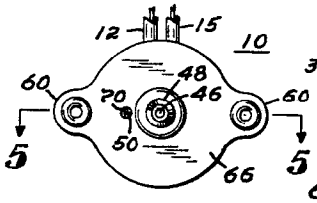




*Fig. 4.*

*Fig. 5.*

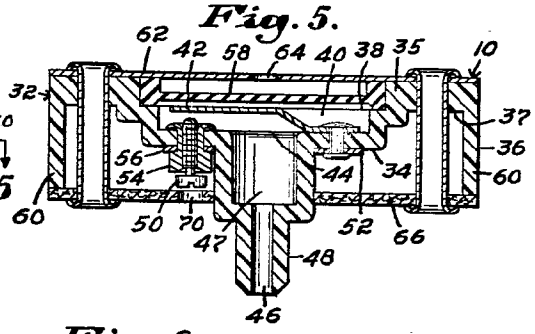



*Fig. 6.*